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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,168	03/12/2004	Naoyuki Enjoji	TOW-068	9057

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EXAMINER	
WANG, EUGENIA	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 11/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/800,168	ENJOJI ET AL.	
	Examiner	Art Unit	
	Eugenia Wang	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-8 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-8 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 3/12/2004 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 3/12/2004.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 2003-073503, filed on March 18, 2003.

Information Disclosure Statement

2. The information disclosure statement filed 12 March 2004 has been placed in the application file and the information referred to therein has been considered as to the merits.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a) because they fail to show the outlet of the cathode [25] in figure 1 (p 7, line 26), as described in the specification. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement

sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by US 2001/0010875 (Katagiri et al.).

Katagiri et al. teaches a humidification system for a fuel cell. The reactive gases are supplied to the fuel cell (air, which supplies oxygen or hydrogen) (para 0038, lines 6-8). In this invention, humidifier [6] is used to humidify the air (para 0039). A supercharger [17] is driven by a motor and used to for delivering air (oxygen-containing reactive gas) to the system, thus acting as a flow-rate controller. The humidity that is imparted on the air is then brought to the fuel cell. The fuel cell [1] comprises of solid polymer membranes that separate oxygen and hydrogen (para 0037). Although the transfer of humidity from the air to the hydrogen via water transport from the cathode to anode is not explicitly stated, since the water permeates the separator membrane and

fuel cell electrodes (anodes and cathodes) are generally porous, it is inherent that the water would diffuse into the anode as well, thus humidifying the hydrogen. It is also inherent that the humidity of the hydrogen would remain at a predetermined range less than 100% (diffusion models can be used). Additionally, a gas bypass passage [21] allows the gas to bypass the humidifier [6]. The flow regulating valve [22] is controlled using outputs from a controller [23], which is hooked up to a device for measuring the dewpoint of the gas [19] (as applied to claim 5) (para 0045). An algorithm for the dew point control of the humidified reaction gas can be seen in figure 3. This bypass system based on dewpoint control, thus allows for control of the humidity in the air and thus that of the hydrogen carrying gas, as stated above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wheat et al. in view of US 2004/0164509 (Kobayashi et al.).

As to claims 1 and 5 Wheat et al. teaches a humidity control for a fuel cell system that includes a gas supply and a humidifier (para 0006, lines 1-2). Typically in the fuel cell, an oxygen stream supplied to the cathode flow line [26] and a hydrogen stream supplied to the anode flow line [28], as can be seen in figure 1. Wheat et al. teaches that the oxygen stream and/or the hydrogen stream can be humidified (para 0024, lines 3-6). Therefore, Wheat et al.'s system is taken to have a humidifier on both the oxygen and the hydrogen stream as applied to this application. Although the transfer of humidity from the oxygen-providing stream to the hydrogen-providing stream via water transport from the cathode to the anode is not explicitly stated, the anode/cathode separation membrane [14] is inherently porous, as to allow ion transfer for electricity generation. Therefore, water would be able to diffuse from the cathode to the anode, thus humidifying the hydrogen carrying gas. It is also inherent that the humidity of the

hydrogen would remain at a predetermined range less than 100% (diffusion models can be used). Wheat et al.'s system also includes a bypass line and a valve bypass gas around the humidifier to control the humidity of the gas entering the inlet of the fuel cell (as applied to claim 5) (para 0006, lines 5-8). For example, figures 5A and 5B have humidifying systems that include a bypass line. In figure 5A, a valve [84] is positioned between the gas supply [60] and the inlet of the humidifier [54]. The bypass line [124] is connected between the gas supply [60] and the valve [84] on one end and the outlet to the humidifier [54] and the humidity sensor [78] on the other end (para 0030). Figure 5B works similarly, except that the valve [84] is put downstream from the humidifier. Both systems control moisture: in 5A, the amount of gas entering the humidifier is controlled by the valve, while in 5B, the amount of gas exiting the humidifier is controlled by the valve. This bypass system allows for control of the humidity in the air and thus that of the hydrogen carrying gas, as stated above.

The difference between Wheat et al. and claims 1 and 5 is that Wheat et al. do not teach a flow rate controller in the oxygen-containing stream.

Kobayashi et al. teaches a gas supplying apparatus airflow controller. The controller [4] sets a target flow amount of the supply air [A] to be required on the basis of the output demand signal. When the target flow amount is increased/decreased, the controller produces a signal to increase/decrease the discharge amount from the control compressor [24]. Feedback control is performed so that the deviation between the signal detected by airometer (flow sensor) [Q] and the target flow amount is zero (para 0054).

The motivation for putting an air controller on the oxygen-containing gas is to control the oxygen flow and subsequently control the amount of electricity produced by the reaction in the fuel cell, as different loads require different amounts of electricity supplied to them. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Wheat et al. by adding Kobayashi's flow controller in order to control the amount of electricity that the fuel cell produces.

The teachings of Wheat et al. and Kobayashi et al. have been discussed above and are herein incorporated.

As to claims 2 and 6, Wheat et al. teaches the fact that the both hydrogen-containing gas and the oxygen-containing gas can have the humidifying system applied to them. Therefore a humidity sensor in the hydrogen-containing gas would be included for detecting the humidity of the hydrogen-containing gas.

As to claims 3 and 7, Wheat et al.'s humidification system has a circulation path for providing the hydrogen-containing gas to the anode. As can be seen, all embodiments of the invention (figures 3, 4A, 4B, 5A, and 5B) have gas supply [60] (both hydrogen and oxygen containing gas) being delivered to the fuel cell stack [56] with a humidity sensor [78] being disposed in the circulation passage.

As to claims 4 and 8 Wheat et al.'s humidification system has as circulation path for providing the hydrogen-containing gas to the anode. As can be seen, all embodiments of the invention (figures 3, 4A, 4B, 5A, and 5B) have gas supply [60] (both hydrogen and oxygen containing gas) being delivered to the fuel cell stack [56].

The difference between the teachings of Wheat et al. and claims 4 and 8 are that there is not a hydrogen-containing gas flow rate controller in the circulation passage.

Since there is a flow controller in the humidified gas of Kobayashi et al.'s, this control system can be applied to the humidified gas of Wheat et al.'s system, which in this case is both the hydrogen-containing gas and the oxygen-containing gas.

The motivation for putting a controller on the hydrogen-containing gas is to control the hydrogen flow so that the amount needed to react with the oxygen is provided, so that neither unreacted oxygen nor hydrogen is lost in the exhaust. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Wheat et al. by adding Kobayashi's flow controller in the hydrogen-containing gas stream in order to ensure efficient use of the reactant gases.

Claims 3, 4, 7, and 8 are alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Wheat et al. in view of Kobayashi et al..

The teachings of claims 1 and 5 have been discussed above and are incorporated herein.

Alternatively, the circulation passage as mentioned in claims 3, 4, 7, and 8 can be interpreted as a re-circulation passage as can be seen in figure 1 of the application (the passage from 30 to 38, across 24, and through 42).

In this case, the differences between Wheat et al. and the claims are that Wheat et al. teach neither a circulation passage that re-circulates the exhaust from the

hydrogen-containing gas (claims 3, 4, 7, and 8) nor a hydrogen-containing gas flow rate controller in the (re-)circulation passage (claims 4 and 8).

Kobayashi et al. teaches a gas supplying apparatus to a fuel cell. In figure 1, it is seen that hydrogen is re-circulated by a path that starts with supply [31], passing to the fuel cell [1], and circulating around as controlled by valve [34] (as applied to claims 3, 4, 7, and 8). This sort of system could be applied to that of Wheat et al. to provide a circulation passage in which the humidity sensor is disposed in it. Additionally Kobayashi et al.'s apparatus teaches a flow controller in the humidified gas stream of their invention (oxygen-containing gas) (as applied to claims 4 and 8). This control system can be applied to the humidified gas of Wheat et al.'s system, which in this case is both the hydrogen-containing gas and the oxygen-containing gas.

The motivation for providing a re-circulation passage is to recycle the exhaust from the anode, thus ensuring that some of the unreacted hydrogen present in the exhaust is returned to the fuel cell to be reacted for provide electricity. It is important to note that the recycle system should be set up such that the humidity sensor is disposed within the re-circulation passage in order to provide accurate control of the humidity, as taught by Wheat et al., with the added re-circulation stream. The motivation for putting a controller on the hydrogen-containing gas is to control the hydrogen flow so that the amount needed to react with the oxygen is provides, so that neither unreacted oxygen nor hydrogen is lost in the exhaust.

Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Wheat et al. with the

recycle system and hydrogen flow controller taught by Kobayashi et al. in order to provide improved usage of hydrogen fuel gas by the humidity control system and to ensure efficient use of the reactant gases.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugenia Wang whose telephone number is 571-272-4942. The examiner can normally be reached on 8 - 4:30 Mon. - Fri., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EW

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PRIMARY EXAMINER